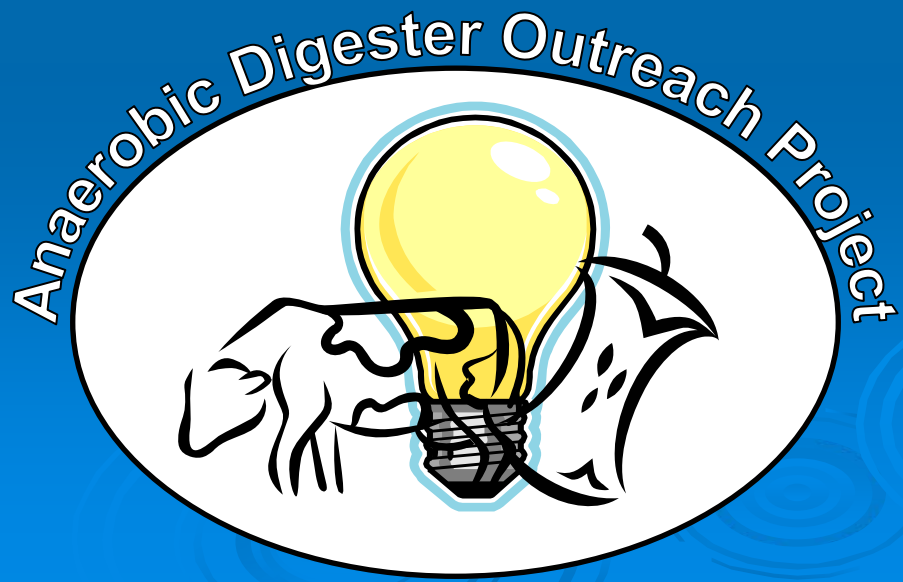
Producer Perception of Anaerobic Digestion

Michelle Crook, P.E.
Michigan Department of Agriculture



Topics

- AD Basics
- ADs Past, Present, and Future
- Why Do MDA and MDEQ care about ADs?
- Benefits to You
- 3 Things You Need to Know About ADs

Anaerobic Digester Process

Feedstocks (manure, food processing residuals, glycerin,syrup stillage, etc.)

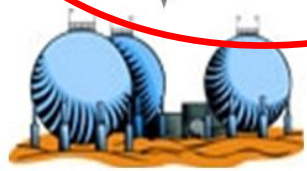
Gas Returned to Heat Digester and Facility

Digester Tank

Biogas

Gas Cleaning Equipment

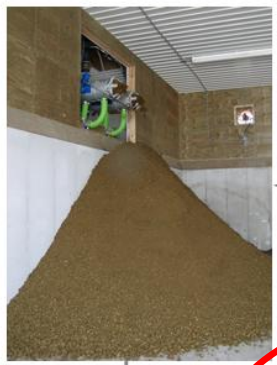
Generator Set



Gas Sold to Natural Gas Utility

Electricity Sold To Electrical Grid

Solid/Liquid Separator



Liquids

Liquid Residuals applied to crops as high value fertilizer

Biofibers

Solid Residuals used as animal bedding or composted and sold as a soil amendment

Michigan's Sorted Past with Anaerobic Digestion

- 11 Digesters Built
- 4 Operational (3 livestock, 1 food processor)
- One Shut Down Due to Sale of Farm
- Six Failed
  - Why?
    - Improper Equipment
    - Sand Bedding Problems
    - Maintenance

Michigan's Future with ADs

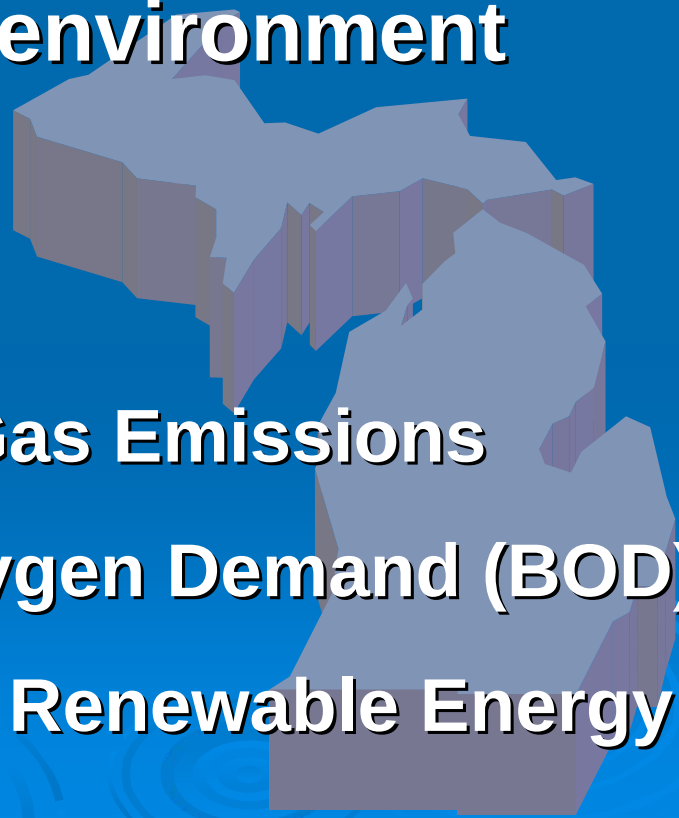
- 10 New Digester Project Under Consideration
  - Grand Valley/Crossroads Dairy
  - Freemont Co-op with Gerbers
  - West Michigan Renewab Regional Digester
  - Cherry Central Co-op
  - Vreba Hoff
  - Huron County Dairy

ADs in the U.S.

- **2003 – 30 Operational Digesters**
- **2006**
  - 51 Plug Flow
  - 26 Complete Mix
  - 1 Two Stage Mix
  - 13 Ambient Temperature Covered Lagoon
  - 5 Mesophilic Covered Lagoons
  - 1 Attached Media
- **Currently Producing over 248 MW/hours Annually**

Why are Anaerobic Digesters (ADs) Important to Michigan?

- **Tool to help sustain strong agricultural economy & a healthy environment**
  - **Reduce Odors**
  - **Reduce Pathogens**
  - **Reduce Greenhouse Gas Emissions**
  - **Reduce Biological Oxygen Demand (BOD)**
  - **Sustainable Source of Renewable Energy**



Why Are ADs important to You?

- Financial Benefits
- Environmental Benefits

Financial Benefits

- Sell electricity to grid
- Sell cleaned biogas
- Use gas and electricity on-site
- Sell greenhouse gas emission credits
- Sell bio-fiber products

Environmental Benefits

- Odor reduction
- Reduce greenhouse gas emissions
- Separated manure easier to apply (less nutrient laden run-off)
- Biofibers can be reused as bedding, compost, or composite building materials
- Pathogens significantly reduced
- Source of renewable energy

3 Things MDA and MDEQ Want You to Know About ADs

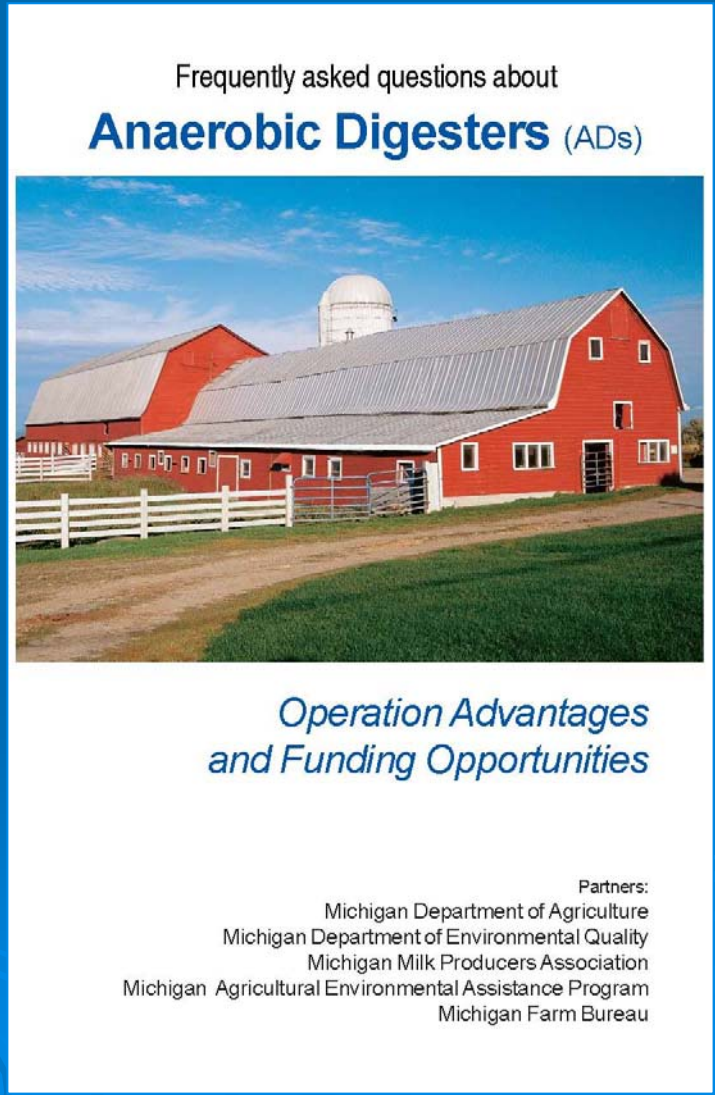
1. Where to Get Funding
2. What Environmental Permits you Need
3. How to Apply AD Technology to Your Farm

Where to Get Funding?

- MDA Agricultural Innovation Grants
- USDA Renewable Energy and E2 Program
- MDEQ Pollution Prevention Small Business Loans
- US DOE Loans
- Federal Alternative Energy Grants
- Property Tax Exemptions
- Water Pollution Control Tax Exemption

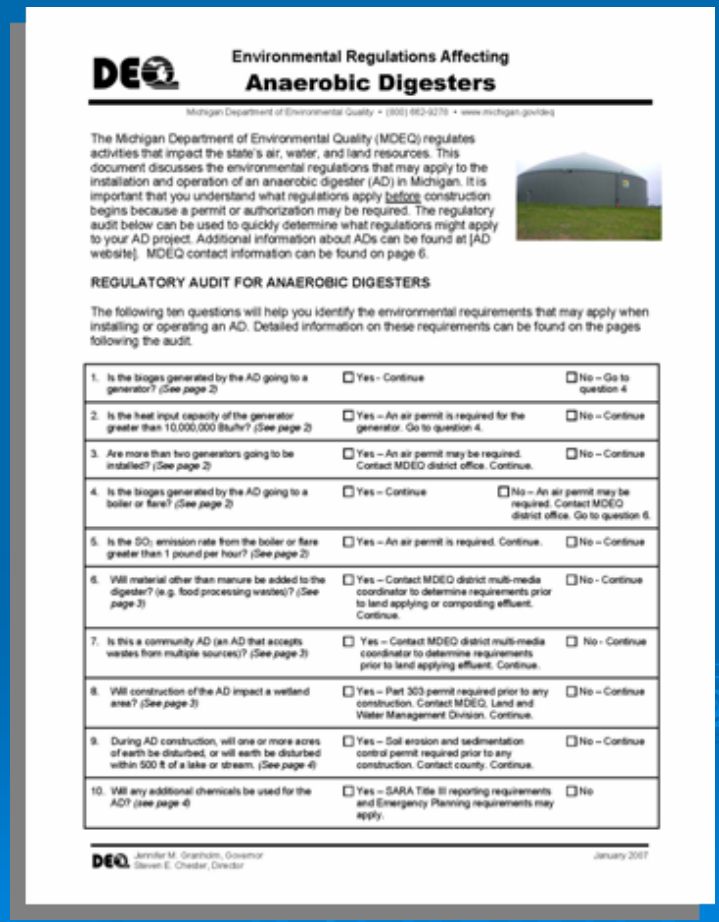
Where to Get Funding?

Additional Info on funding and benefits



What Environmental Permits Do I Need?

- Air
- Water
- Wetlands
- Soil Erosion
- Planning/Reporting
- Waste



DEQ

Environmental Regulations Affecting
Anaerobic Digesters

Michigan Department of Environmental Quality • (800) 662-9278 • www.michigan.gov/deq

The Michigan Department of Environmental Quality (MDEQ) regulates activities that impact the state's air, water, and land resources. This document discusses the environmental regulations that may apply to the installation and operation of an anaerobic digester (AD) in Michigan. It is important that you understand what regulations apply before construction begins because a permit or authorization may be required. The regulatory audit below can be used to quickly determine what regulations might apply to your AD project. Additional information about ADs can be found at [AD website]. MDEQ contact information can be found on page 6.

REGULATORY AUDIT FOR ANAEROBIC DIGESTERS

The following ten questions will help you identify the environmental requirements that may apply when installing or operating an AD. Detailed information on these requirements can be found on the pages following the audit.

1. Is the biogas generated by the AD going to a generator? *(See page 2)*	☐ Yes - Continue		☐ No – Go to question 4
2. Is the heat input capacity of the generator greater than 10,000,000 Btu/hr? *(See page 2)*	☐ Yes – An air permit is required for the generator. Go to question 4.		☐ No – Continue
3. Are more than two generators going to be installed? *(See page 2)*	☐ Yes – An air permit may be required. Contact MDEQ district office. Continue.		☐ No – Continue
4. Is the biogas generated by the AD going to a boiler or flare? *(See page 2)*	☐ Yes – Continue	☐ No – An air permit may be required. Contact MDEQ district office. Go to question 6.	
5. Is the SO_2 emission rate from the boiler or flare greater than 1 pound per hour? *(See page 2)*	☐ Yes – An air permit is required. Continue.		☐ No – Continue
6. Will material other than manure be added to the digester? (e.g. food processing wastes)? *(See page 3)*	☐ Yes – Contact MDEQ district multi-media coordinator to determine requirements prior to land applying or composting effluent. Continue.		☐ No - Continue
7. Is this a community AD (an AD that accepts wastes from multiple sources)? *(See page 3)*	☐ Yes – Contact MDEQ district multi-media coordinator to determine requirements prior to land applying effluent. Continue.		☐ No - Continue
8. Will construction of the AD impact a wetland area? *(See page 3)*	☐ Yes – Part 303 permit required prior to any construction. Contact MDEQ, Land and Water Management Division. Continue.		☐ No – Continue
9. During AD construction, will one or more acres of earth be disturbed, or will earth be disturbed within 500 ft of a lake or stream. *(See page 4)*	☐ Yes – Soil erosion and sedimentation control permit required prior to any construction. Contact county. Continue.		☐ No – Continue
10. Will any additional chemicals be used for the AD? *(see page 4)*	☐ Yes – SARA Title III reporting requirements and Emergency Planning requirements may apply.		☐ No

DEQ Jennifer M. Granholm, Governor
Steven E. Chester, Director

January 2007

What Environmental Permits Do I Need?

- **Air Quality Regulations**
  - Where is Biogas going?
    - Generator
    - Flare
    - Boiler
  - May Need an Air Permit

What Environmental Permits Do I Need?

- **Waste and Water Regulations**
  - May be restrictions on whether effluent can be land applied
  - Contact MDEQ if inputs other than on-farm manure will be added



What Environmental Permits Do I Need?

Contact DEQ

800.662.9278

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January 2007

How do I Apply AD Technology to My Farm?

- ADs are farm specific
  - “One size does NOT fit all”
- Use a qualified consultant
- Operator training
- Good management is critical
  - System will require more maintenance then traditional storage

How do I Apply AD Technology to My Farm?

Case Study

Michigan Department of AGRICULTURE

DEQ

Anaerobic Digester Case Study
Scenic View Dairy – Fennville, Michigan

The Scenic View Dairy is a dairy farm in Fennville, MI that houses approximately 2200 head of cattle. Prior to the installation of the anaerobic digester, Scenic View utilized sand for animal bedding which has now been 100% replaced by the separated digested biofibers which is 99.9% sanitized and virtually odor free. The methane produced from this system is also of excellent quality (60%) that is utilized in electric generators for on-farm use as well as sold to the power grid for the use of the community. This farm will be the first in the world to combine electricity generation with biogas upgrading to pipeline standards, providing a second option for revenue optimization. The reduction in methane emissions resulting from the digestion process, as well as emission offsets for replacement of fossil-fuels, will be converted to carbon equivalents, and traded on the Chicago Climate Exchange for additional revenue.

Farm Name:	Scenic View Dairy	**Location:**	Fennville, MI
Farm Type:	Dairy	**Herd Size:**	2200 Head
Collection Method:	Loaded into storage bin and pumped into tank	**Bedding Type:**	Separated biofibers
Digester Type:	Complete – mix, stirred reactor	**Design Temperature:**	100°F
Design Capacity:	(2) 870,000 gal	**Date Operational:**	2006
Design HRT:	23-28 Days	**Current HRT:**	28 Days
Design Solids %:	Up to 20%	**Current Solids %:**	Varies
Biogas Use:	Electricity generation, heat, pipeline gas	**Utility Contract:**	Yes, both electric and gas
Solids Separation:	Yes	**Solids Use:**	Bedding
Design/ Engineering:	Phase 3 Developments & Investments Biogas Nord GmbH, Sheff & Sons Eng., Theka Associates Eng.,Resource Engineering	**Utility:**	Consumers Power Michigan Gas Utility

Project Background:
Installation and operation began in 2006 on this complete mix system to enhance the environmental consciousness of the farm's operations. This digester was chosen due to the amount of successful systems already in operation in Germany which include the following features:

- The integrated floor and wall heating ensures even heating of the concrete (very low heat stresses) and a small spread between the heating supply and return (easy to regulate).
- Every fermenter is fitted with a sediment discharge device to allow regular removal of deposited substances.
- Every installation inside the fermenter is made of non-corroding materials (plastic, stainless steel, wood, etc.).
- The insulation is clad with non-corroding and weatherproof aluminum trapezoidal panels.
- Includes a working platform and sight glasses in order to be able to choose the optimum settings for the mixing devices, whose height and direction can be adjusted, and for early detection of process-related biological changes inside the fermenter during operation (e.g. formation of supernatant liquid).
- The double-membrane roof can be opened quickly for maintenance work.

For More Information

- MDEQ – 800-662-9278
- MDA – 517-335-2487
- Publications
- Website – www.michigan.gov/mda